SC D2

# Information Systems, Telecommunications and Cybersecurity

by Victor Tan, Chair, and Joël Nouard, Secretary

## Mission and scope

### Mission

Study Committee D2's mission is to develop, facilitate collaboration, and disseminate knowledge within the power industry in the areas of Information Systems, Telecommunications, and Cybersecurity

### Principal areas of interest

- Studying and considering **the evolution of information and telecommunication technologies** to cope with traditional and new requirements driven by the digital transformation in power industry including extension of Distributed Energy Resources
- Assessment of Technologies and architecture to assure **business continuity and disaster recovery**
- **Overcoming security threats** in the deployment of the networks of the future and especially in Smart Grids

### Scope

#### Interoperability and data exchange

between Electricity Network Grid Operators, System Operators, Market Operators, Generation Companies, Industrial Product Manufacturers, Telco Operators, ICT services providers, Energy Regulators, Certification Entities

#### Telecom network technologies and management:

- Studying and considering telecommunication technologies and architecture evolution
- Assessment of technologies and architecture to ensure business continuity and disaster recovery

- Telecommunication network management when deploying new technologies and architectures

### Implementation of the networks of the future:

- Monitoring of experiences and proof of concepts of smart technologies Impact on the existing ICT systems such as telecommunication network and equipment
- SCADA, enterprise business functions (Smart Grid Architecture Model domain)

### New digital trends used by EPU and new business services:

- Monitoring on the field experiences on the deployment of digital equipment such as IEDs, PMUs, IoT, Fog and Cloud Computing, Network Function Virtualization, as well as the processing of large quantity of information (big data) in the domains of asset health, system operation, smart metering.

### Cybersecurity:

- Assessment and promotion of best practices, tools, and solutions of cybersecurity from field equipment (protection) to corporate IT supporting the whole resilience strategy along the system life cycle: design, implementation, testing, operation, and maintenance.
- Cybersecurity challenges related to new devices, technologies and DER interconnection and the additional data exchanges between Transmission System Operators, Distribution System Operators and Significant Grid Users, as required by the flexibility management of future grids

## Membership

SC D2 consists of the 24 regular members, 5 additional regular members and 12 observer members representing overall 36 countries.

## Advisory Groups

| Title | Convenor |
|---|---|
| Core business information systems and services | Marcelo Costa de Araujo (BR) |
| Cyber Security | Giovanna Dondossola (IT) |
| Telecommunication networks, services and technology | Zwelandile Mbebe (ZA) |

# Publications

## Technical Brochures


**TB 892** Impact of governance regulations and constraints on EPU sensitive data distribution and location of data storage

Due to the development of information and communication technologies (ICT) especially public ICT services, like mobile services and cloud services, tremendous possibilities of data processing and sharing occur. Electric Power Utilities are entering a new era of information sharing in a borderless environment facilitated by cloud-based services, ubiquitous mobility, and expanding use of personal devices. This borderless behavior is the root issue that has initiated strong governance requirements by local authorities. Data protection is not only a technical issue, it requires a coherent balance of technical und juridical aspects. This requires risk assessment teams, and they must adjust the approach to updating security policies, procedures, and organizational directives.

## Article in Future Connections Newsletter

D2 has published an article in "**Future Connections Newsletter**" in 2023.

- **#13** "CIM (Common Information Model) methodology" by Roman Bogomolov (RU), WG D2.57 Convener, and Nikolay Belyaev (RU), WG D2.57 Secretary

## Article in Electra

D2 is aiming to publish an article in ELECTRA by the end of 2023. Last publication was :

- Article "An open-source driven transformation in the power industry" by Lucian Balea (R&D Program Director and open source manager, RTE), Benoît Jeanson (Open Source Enterprise Architect, RTE), Arjan Stam (Director of System Operations, Alliander)

## Article in CSE

- **CSE N.27,** January 2023 – Publication of the Best papers of Paris Session 2022. SC D2 best paper "DAS Technology: an opportunity to use fibre optics for asset monitoring and security applications in Electric Power Utilities" by S. Kwik, J.M. Abad - Red Eléctrica de España, Spain; R. Martínez, J. Preciado - Aragón Photonics Labs, Spain; P. Sevillano, J. Subías - Universidad de Zaragoza (Grupo Tecnologías Fotónicas), Spain
- **CSE N.28**, March 2023 – Thesis award paper "Integrated Modelling, analysis and optimization for cyber-Physical power systems considering the impact of communication networks" selected by a panel of experts within CIGRE. The authors are L. Xu, Secretary of WG D2.56 on "Interdependence and Security of Cyber-Physical Power System"from China entitled", Department of Electrical Engineering, Tsinghua University, Beijing, China - Department of Civil and Environmental Engineering, Princeton University, NJ, USA; and Q. Guo, WG D2.56 Convenor, Department of Electrical Engineering, Tsinghua University, Beijing, China

- **CSE N.29**, June 2023 – Publication of the paper “Short term forecasting peak load hours of regional power systems using machine learning methods” by SC D2 regular member F. Nepsha, "RTSoft - Smart Grid" LLC, T.F. Gorbachev Kuzbass State Technical; V. Voronin - T.F. Gorbachev Kuzbass State Technical University, Russia; M. Krasilnikov - "RTSoft - Smart Grid" LLC, Russia

# CIGRE Cairns Symposium 2023 - “The End-to-End electricity System: transition, development, operation and integration”

SC D2 contributed to the Cairns Symposium with two tutorials and four majors and very successful events.

## TUTORIALS

### “Enabling Teleprotection over Packet Switched Networks”

Presenters: **MM. Brenton Aardenburg (AU), James Cole (AU), Santosh Koirala (AU)**

This tutorial presented considerations, challenges and opportunities for using teleprotection on packet networks. Topics include overview and criticality of teleprotection scheme applications; review of teleprotection time synchronisation methods; overview of TDM networks and IEEE C37.94; overview of packet networks including MPLS IP and TP; methods for C37.94 circuit emulation over packet switched networks; teleprotection cyber security recommendations, and opportunities for using IEC 61850 GOOSE and R-GOOSE over packet networks between stations.

### “Time in Communication Networks, Protection and Control Applications”

Presenter: **Mr. Antti Viro (FI)**

The Tutorial was presented in person by John GING (IE); Florian AINHIRN (AT); Rachel BERRYMAN (IE); Luiz CHEIM (US) and remotely by Kun Lun GAO (CN).
This tutorial summarized the past activities and working outcome from the D2.52 Working Group. It aims at providing a comprehensive reference on AI applications and key technologies in power industry, including the requirements and targets, AI framework, applicability and maturity, typical practice, and new challenges of applying AI technologies in power industry.

## D2 Session

Including three Preferential Subjects:

### Digital transformation and AI in asset management

Moderators: **Gareth Taylor (GB), KunLun Gao (CN)**

In this sequence of the session, we had the presentation and discussion of 11 full papers from 5 different countries. Including 5 papers from Japan, 2 papers from Australia and 2 papers from India. There were presentations of novel tools and technologies as required to address the challenges relating to digital transformation and AI in asset management in order to enable cost-effective, sustainable and resilient operation and management of future end-to-end electrical power systems.

### Network infrastructure and telecommunications

Moderators: **Lars Konrad Silset (NO), Marcelo Araujo (BR)**

In this sequence we had the presentation and debates of 5 full papers from 4 different countries.

Besides the ongoing energy transition from fossil energy resources to decentralized renewable power sources, the power utilities are facing different challenges. This session mainly focused on two of them:

- End-of-lifetime for SDH/TDM communication networks. A transition to modern packet based technology for transporting tele-protection services seems to be essential
- More and more edge services, e.g video recording with transmission in real time, requires IP network with wider bandwidth and enhanced resilience.

### Cybersecurity

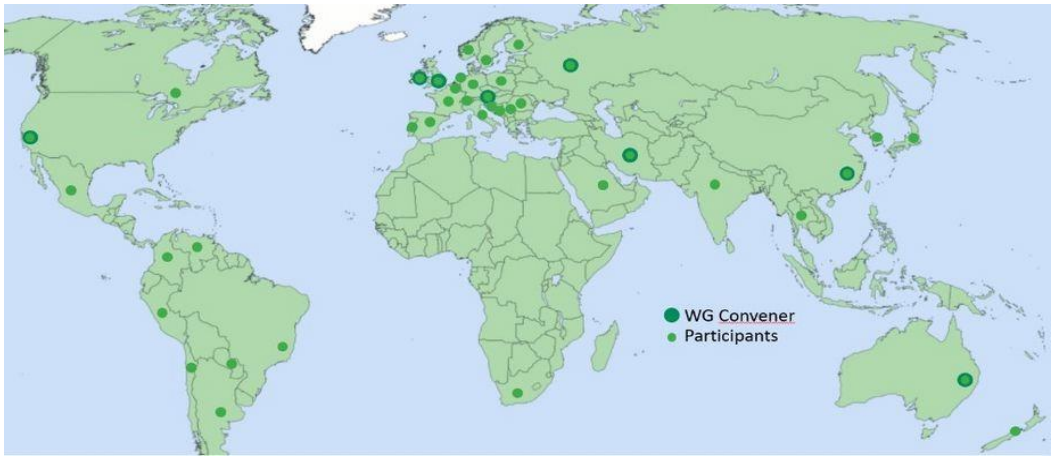
Moderators: **Chen Ching Liu (US), Louise Watts (AU)**

In this sequence we had the presentation and discussion of 5 full papers from several countries. The papers covered a range of important topics related to cyber-physical system security of the power grid: 5G VPN and cyber security enhancement, cyber intrusion detection and mitigation on voltage/var control, a holistic approach to cyber resilience, as well as two papers on Security Operations Centres. These papers involved the vulnerability assessment, detection and mitigation as well as cyber resilience of the power grid through SOC.

## Active Working Groups

The total number of Working Groups at the end of 2023 is 15, gathering more than 200 experts from 40 countries. New working group launched in 2023 is:

- **D2.58 -** *Monitoring, Maintenance and Control of Packet Networks & Services – From Situational Awareness to Network Control*




SC D2 members and experts' global diversity

As a transverse Study Committee, D2 aims at collaborating with other SCs whenever it seems useful.

### Core and Business Systems

**JWG D2/C6.47** – Advanced Consumer Side Energy Resource Management Systems
**JWG D2/C2.48** - EnhancedInformation and Data Exchange to enable Future Transmission and Distribution Interoperability
**JWG B2/D2.72** - ConditionMonitoring and Remote Sensing ofOverhead Lines
**WG D2.49** - Augmented reality / Virtual reality to support Operation and Maintenance In Electric Power Utilities
**WG D2.52** - AI Application and Technology on Power Industry
**WG D2.53** - Technology and Applications of Internet of Things in Power Systems
**WG D2.56** - Interdependence and Security of Cyber-Physical Power System
**JWG A2/D2.65** - Transformer Digital Twin – concept and future perspectives
**JWG B3/D2.62** - Life-long Supervision and Management of Substations by use of Sensors, Mobile Devices, Information and Communication Technologies
**D2.57** - CIM (Common Information Model) Methodology

### Cyber Security

**WG D2.51 -** Implementation of SOC in EPI as Part of Situational Awareness System
**WG D2.54 -** Regulatory approaches to enhance EPU's cybersecurity frameworks
**Plus:** Active link with IEC TC57 WG15, on IEC 62351

### Telecommunication infrastructures or services

**WG D2.44 -** Usage of public or private wireless communication infrastructures for monitoring and maintenance of grid assets and facilities
**WG D2.55 -** Application of 5G Technology to Smart Grids
**WG D2.58 -** Monitoring, Maintenance and Control of Packet Networks & Services – From Situational Awareness to Network Control

## Future Activities

The 2024 Paris session planning and paper review is currently in progress. We are anticipating a record number of papers in next year's CIGRE Paris session in August 2024.

## Conclusion

As we move through 2023, the trend toward decarbonization within the industry persists, with the power sector persistently innovating and leveraging both new and established technologies.

Study Committee D2, remains a pivotal force in fostering collaboration and knowledge sharing, aimed at supporting global utilities through the energy transition. This was clearly demonstrated at the successful CIGRE 2023 Symposium in Cairns.

The expertise of Study Committee D2 covers three critical areas: Information Systems, Telecommunications, and Cybersecurity. These fields are increasingly vital for power utilities, intersecting with every facet of the power system supply chain.

I look ahead to 2024 with excitement and anticipation, as SC D2, and CIGRE, continues to make meaningful contributions to the industry. We are committed to evolving into a more accessible organisation, reinforcing and initiating collaborations, and enriching the expertise of our members and the wider community through our Working Groups, publications, and events, including the much-anticipated Paris 2024 Session in August.

## Contact

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